This Arithmetic Course of Study is designed to give our teachers definite and specific help so that all may refer to it and obtain information whenever needed. It is not designed to force slow learners, nor hold back those who learn rapidly, but rather to stimulate learning at all grade levels and establish certain definite goals of achievement. If other more extensive information is desired by teachers we recommend the use of the Pennsylvania Elementary Course of Study which has been designed for use of all schools throughout the Commonwealth and therefore contains a wealth of general information not included in this specific Course of Study for the use in a particular school system.

We stress review work for all grades for the first few weeks of every new semester, especially in the fall after the long summer vacation. Many facts will need re-teaching, and most will need a period of review of the previous semester's work.

Evaluation of all work taught is also one of the "musts" in our teaching situations. Check and re-check to make sure that information which should be understood is actually understood by all pupils in the class.

The Committee
March 1953.

AIMS FOR PRIMARY GRADES

1. To create in the children an interest in numbers and to build up right attitudes toward them.

2. To keep the fundamental number facts and processes taught within the children's actual experiences and of a nature to minister to their needs.

3. From the beginning to keep the children's "experiences" in arithmetic - concrete, meaningful, and significant.

4. To develop understanding, accuracy, and mastery of the essential skills in computation and number manipulations progressing from the concrete to the abstract.

5. To develop a basic arithmetic vocabulary, to develop in the children the habit of expressing themselves in arithmetic terms.

AIMS FOR INTERMEDIATE GRADES

1. Develop accuracy and understanding of essential skills.

2. To develop logical thinking and reasoning to help the child use the skills acquired.

3. To develop right attitudes toward effective use of everyday arithmetical situations.

4. To develop continued interest in further use and practice of necessary arithmetic as used in life activities.

COMMITTEE MEMBERS

Grade 1

Violet Schutte
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III.

TABLE OF CONTENTS

Grade I

The first few months of the child's number experience in school may be known as a readiness period. This readiness involves a certain background and attitude toward quantitative ideas on the part of the children, and is the special problem of the teacher during this period.

The development of number readiness entails organizing the child's own experiences in number, developing a background of number concepts, and gradually building a basic number vocabulary.

During the first semester great <u>stress should be placed upon number concepts, through the use of objects and pictures.</u>

Have the children count orally and rationally <u>to 10.</u>

Vocabulary concepts listed in Section IV should be taught as the need arises and as they correlate with the activities in the room.

The remainder of the outline should be completed by the close of the second semester.

References fpr Grade I

Quantitative Aspects of Experiencing in the Elementary School, Bulletin 360, Department of Public Instruction, Commonwealth of Pennsylvania.

Teaching Arithmetic in the Elementary School, Primary Grades - R.L. Morton, Silver Burdett Company.

Understanding Numbers - Studebaker, Knight and others.
Scott, Foresman and Company.

Teaching the New Arithmetic - Wilson, Stone, and Dalrymple.
McGraw Hill Book Company, Inc.

I. Number Concepts

II. Formation of Numbers 1 - 100

III Counting orally

IV. Vocabulary Concepts

V. Time

VI. Association of numbers and words - one to ten.

VII. Addition facts

I. Number Concepts 1 - 10

1. Use of co ncrete objects 1 - 10
   a. Number of seats in a row, chairs in a room, children in group, etc.
   b. Charts and pictures
   c. Number groups in various patterns. Example 6 :

000	o o	oo
	oo	
000	o, o	oooo

2. Read and write the numbers 1 - 10.
   Illustrate each number with pictures.

3. Semi-concrete material
   a. Transition from concrete to abstract concepts.
   b. Bridge the gap between concrete and abstract numbers slowly and adequately with solving of simple oral problems according to various abilities.
   Example: 2 chairs and 2 chairs are 4 chairs to 2 and 2 are 4.

II. Formation of Numbers 1 - 100

1. Reading and writ ng numbers 1 - 100.
   a. By 1's
   b. Number games and rhymes. Ten little Indians
                                 One, two, buckle my shoe.

2. Supply missing numbers 1, 2, 3, ____, 5.
3. What number comes before and after?
4. What number comes between 7 and 9?

III. Counting orally 1 - 100

1. Counting, reading and writing of numbers.
   By 1's to 100
   By 10's to 100
   By 5's to 100
   By 2's to 24

2. Number Sequence

3. Ordinals - first, second, third, etc.

IV. Vocabulary Concepts

1. Comparative values

   big..........little   front..........back
   large........small   narrow.........wide
   high.........low   left...........right
   tall.........short   before.........after
   near.........far   first..........last
   up...........down   higher.........lower
   more.........less   larger.........smaller
   most.........fewest   taller.........shorter
   highest......lowest   nearer.........farther

2. Geometric figures: circle, square, triangle.

3. Everyday measures
   a. Weights
      Pounds (your weight: buying food - 1 pound butter,
      2 pounds sugar).
   b. Distance
      Miles (speedometer in automobile for trips)
   c. Quantity
      Cups, pint, quart, gallon.
      (1) Various measuring devices.
      (2) Uses (kitchen, recipes, buying food or buying
          gasoline.
      (3) Things prepared in quantities for delivery.
          (Milk, ice cream, gasoline)

4. Money
   a. Cent, nickel, dime, quarter, half-dollar, dollar.
   b. Count money for savings stamps, milk, cafeteria, other
      school room situations involving money such as,
      contributions to welfare fund.

5. Introduction to addition
   a. Meaning of adding numbers
   b. Arrange groups of objects (concrete examples)
   c. Adding numbers to the sum of 10.
   d. Oral problems for solution
      Addition - 1 and 1 are 2.
      Subtraction 1 from 2 leaves 1.

V. Time

    1. Calendar
        a. Use of calendar for birthdays, holidays, vacation days, special programs at school.
        b. Recognition of month and days of week.
        c. Number of days per month (30 or 31 except for February)
        d. Number of days in a week.

    2. Clock
        a. Hour and minute hands.
        b. Recognition of hour.
        What time do you go to bed, eat breakfast, go out for recess?
        c. Draw clock face to illustrate hours only.

VI. Association of numbers and words — one to ten.

VII. Addition facts only with sums of 10.
    Subtraction facts.

    The teacher should provide adequate concrete number experiences which bear a close relation to life and to the children's actual needs.

    Correlate all arithmetic with classroom situations as they arise. Numbers must have a function to be meaningful.

    Always review preceding unit's work.

Grade 2

I. Minimum Requirements   Units 5-6   Grade 2-1

  A. Reading and writing numbers.

    1. Continuation of development of number concepts by use of objects.
    2. Reading two figure numbers.
    3. Writing numbers from dictation from 1-250.

  B. Fundamental Processes

    1. Addition
      a. Mastery of number facts from 1-10
      b. Addition of two figure numbers, without carrying.
      c. Adding three one figure numbers.
      d. Use of + sign.

    2. Subtraction
      a. Corresponding subtraction facts.
      b. Subtraction of two figure numbers, without borrowing.
      c. Use of - sign.

    3. Multiplication
      a. Counting by two's to 50.
      b. Multiplication facts of 2's
      c. Use of X sign.

    4. Division
      a. Corresponding division facts.

  C. Denominate Measures

    1. Quart
    2. Pint
    3. Inches
    4. Foot
    5. Yard

  D. Social Uses of Arithmetic

    1. Telling time on the hour.
    2. Finding page numbers.
    3. Value of penny and nickel.
    4. Continuation of comparative values.

  E. Problem Solving

    Simple, oral, concrete one step problems, requiring the application of addition, subtraction, and multiplication facts taught.

  F. Diagnosis and Remedial Work

    Attainment tests, and various diagnostic tests.

I. Minimum Requirements   Units 7-8   Grade 2-2

A. Reading and writing numbers.

   1. Reading and writing two and three figure numbers from 250 - 1000.
   2. Teach words.
   3. Roman numerals.

B. Fundamental Processes

   1. Addition
        a. Mastery of number facts from 10 - 20.
        b. Addition of two figure numbers without carrying.
        c. Adding three one figure numbers.

   2. Subtraction
        a. Corresponding subtraction facts.
        b. Subtraction of two figure numbers without borrowing.

   3. Multiplication
        a. Multiplication facts of 3's to 9's.
        b. Multiplication of two figure numbers without carrying.

   4. Division
        a. Corresponding division facts.

C. Social Uses of Arithmetic

   1. Teach terms.

D. Problem Solving

   1. Writing dates.
   2. Telling time on hour and half hour.
   3. Finding page numbers.
   4. Value of penny, nickel, dime, quarter, half-dollar.
   5. Recognizing numbers in everyday activities.

E. Diagnostic and Remedial Work

   1. Simple written one step concrete problems requiring the application
      of addition and subtraction facts taught.

   2. Multiplication facts.

First Report Card Period

1. Counting and writing numbers from 1-250.

2. Reading page numbers, supplying missing numbers, etc. Anything involving the use of numbers.

3. Addition facts and corresponding subtraction facts from 1 through 10.

Second Report Card Period

1. Multiplication facts of 2's through to 9's and reversals correlated with addition facts.
Corresponding division facts.

2. Review of semester's work.

3. Correlate denominate measures, social uses, problem solving, and testing.

Third Report Card Period

1. Counting and writing numbers from 250-1000.

2. Reading numbers, supplying missing numbers, etc. Anything involving the use of numbers.

3. Addition facts and corresponding subtraction facts from 10-20. (See outline).

Fourth Report Card Period

1. Multiplication facts of 3's through to 9's and reversals correlated with addition facts.
Corresponding division facts.

2. Review of semester's work.

3. Correlate denominate measures, social uses, problem solving, and testing.

Minimum Requirements in Detail

A. Reading and Writing Numbers

Continue development of number concepts through the use of objects. (Ex. Using persons and objects)

Reading and writing numbers through 1000.

Suggested practices
1. Read these numbers – 2; 11; 13; 90; 105; 146; 250.
2. Write these numbers in words and vice-versa – 1 – 10.
3. Finding page numbers.
4. Write these numbers in order. Begin with smallest, or largest.
   12 – 11 – 13 – 19 – 17 – 15 – 16 – 14 – 18
5. Comparative numbers
   Which is larger?   19 – 33
   Which is smaller? 18 – 45
   Which is more?   15 – 24
   Which is less?   34 – 22

B. Social Uses

1. United States money
   a. Recognition of U.S. coins.
   b. Writing U.S. money to $1.00 Ex: 1¢; 2¢; 3¢; 4¢; 25¢; $1.00.
      Use in simple oral problems.

2. Telling time
   a. Hour
   b. Half-hour

3. Writing date

4. Roman numerals – (Omit enclosure lines – top and bottom)
   a. Reading through 12.
   b. Writing through 12.

5. Denominate measures
   a. Pint, quart, inch, yard, dozen, half-dozen.
   b. Also use of special collective terms as "pair" and "dozen".

C. Fundamental Processes

1. Addition
   a. Vocabulary – add, plus, and.
   b. When introducing "0" always use the term "zero".
   c. Addition facts to be taught: --

Easier Facts																
0	5	2	3	1	3	1	6	7	1	8	2	0	0	1	1	8
0	5	2	3	2	1	1	1	1	6	1	9	4	2	4	3	2
4	4	2	0	5	6	1	8	9	0	9	4	4	1	5	2	1
5	4	3	5	1	6	7	0	2	6	1	1	2	9	2	7	8
2	1	3	5	2	2	2	5	9	2	0	4	3				
8	0	4	4	4	0	1	0	3	6	1	6	8				

3	0	4	0	9	6	0	7	1	3	0	6	4	8	6	6
0	3	0	8	0	3	7	0	5	2	9	0	3	3	2	5

3	5	2	3	7	4	7	8	7	3	5	3	4	7	6	5
2	3	5	5	2	7	4	4	5	7	6	9	8	3	4	7

The combinations gradually increasing in difficulty until the sum of 20 has been achieved.

It is suggested that this test be mimeographed (hectographed) and given for diagnostic purposes. For remedial w ork it would be advisable that the test be run off with the answers and put into the hands of the children.

    d. Suggested Activities -
       Add 3 to each: 1 - 5 - 4 - 7, etc.: sums not to exceed 20.

Add down
No carrying

    e. Addition of one column
       one order

1
1
1

Addition of two co lumn,
two orders

64
35
10

Addition of three column,
two orders

231
411

First steps from the basic facts in the direction of column addition should be to examples such as these whose sums do not exceed 10.

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3
1	2	3	4	5	6	7	8	2	3	4	5	6	7	3	4	5	6

1	1	2	2	2	2	2	2	2	2	2	3	3
4	4	2	2	2	2	2	3	3	3	4	3	3
4	5	2	3	4	5	6	3	4	5	4	3	4

Other three-digit combinations:

1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
1	2	2	3	3	4	4	5	5	2	2	3	3	4	4	5
2	8	9	7	8	6	7	5	6	7	8	6	7	5	6	5

    f. Use of + sign - 2+3 =   9 +1 =   3 plus 2 =

    g. Checking: check by adding up

    h. Simple and written concrete one-step problems using the facts taught.

  II. Subtraction
    a. Vocabulary: subtract - minus - take away - less - more than
    b. Teach the following facts:

Easier Facts																	
0	5	3	7	1	8	3	4	5	6	4	9	9	3	5	6	5	9
0	1	2	7	1	1	2	4	3	6	2	1	2	0	4	0	2	0
6	3	2	7	6	9	4	8	4	5	5	6	4	2	10	10	6	2
1	1	1	1	5	8	1	4	0	5	0	3	3	2	1	2	2	0
7	6	7	8	10	9	11	12	8	1	8	7	7	9				
0	4	2	8	5	5	2	6	0	0	7	3	5	3				

Harder Facts																	
7	8	10	9	8	12	10	10	9	9	8	10	10	11	9	7	12	11
6	2	7	7	6	8	6	4	4	6	3	9	3	7	2	4	9	5
10	11	11	12	11	8	12	11	12	11	12							
8	3	4	7	6	5	3	9	4	8	5							

Follow the same advice as given for the addition facts.

<u>Suggested Activities:</u>

    a. Two place numbers without borrowing

$$\begin{array}{r} 76 \\ -24 \\ \hline \end{array} \qquad 8 - 4 = $$
$$8 \text{ minus } 4 = $$

$$\begin{array}{r} 76 \\ -24 \\ \hline \end{array} \text{ (with sign)} \qquad \begin{array}{r} 76 \\ 24 \\ \hline \end{array} \text{ (without sign)}$$

    b. Simple subtraction, no borrowing, zero in answer

$$\begin{array}{r} 93 \\ -83 \\ \hline \end{array} \qquad \begin{array}{r} 93 \\ 83 \\ \hline \end{array} \qquad \begin{array}{r} 793 \\ -392 \\ \hline \end{array}$$

$$\begin{array}{r} 68 \\ -8 \\ \hline \end{array} \qquad \begin{array}{r} 59 \\ -2 \\ \hline \end{array}$$

In teaching subtraction, <u>say</u> 4 <u>from</u> 8 <u>leaves</u> 4.

<u>Suggested plan for teaching numbers in the Primary Grades.</u>
Dr. Thiels of Detroit, Michigan, has worked out this plan and it has been very successful in Detroit.

    1. Combinations adding 1.   Reverse
    2. Combinations adding 2.   Reverse
    3. Combinations adding 0.   Reverse
    4. Doubles.
    5. Doubles plus 1.
    6. Doubles plus 2.
    7. Combinations which are one less than doubles as;

        3 plus 2   4 plus 3   5 plus 6   7 plus 6
        8 plus 7   9 plus 8   5 plus 4

    8. Combinations adding 10.
    9. Combinations adding 9.   Reverse
  10 Combinations left to be taught -

        5 plus 3   6 plus 3   7 plus 3   4 plus 6
        4 plus 7   4 plus 8   5 plus 8   8 plus 6
        8 plus 3   5 plus 7

    11. After the addition facts have been thoroughly taught, begin the subtraction facts.

III. Multiplication Facts

The sign (x) should be used only as a sign to tell the children the method to use.
   a. Say — "Six 2's"; "Two 4's", etc.
   b. Teach the following facts:

<u>Desirable teaching order:</u>

2	5	8	4	6	3	7	9	1	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3

(and reverse)

Begin by teaching the 2's. The 2's are easy because of their intimate relationship to the doubles in addition. Pupils who are proficient in their addition combinations, already know the 2's in multiplication and need merely to learn the meaning of multiplication and to become accustomed to the language of multiplication.

<u>Suggested method:</u>

For the first two combinations, $\frac{2}{2}$ and $\frac{5}{2}$, the lesson may proceed in some such manner:

Teacher: "Let us go back to some of our numbers in addition. How many are 2 and 2?"

Pupil: "Four."

Teacher: Writing on the blackboard $\frac{2}{2}$. "Yes. Two and two are four. How many 2's did I write?"

Pupil: "Two."

Teacher: "Then we can say that in another way. Instead of saying 'two and two are four,' we can say, 'two 2's are four.' Now, let us take another example. How many are 5 and 5?"

Pupil: "Ten."

Teacher: Writing $\frac{5}{10}$. "Yes. Five and five are ten. How many 5's did I write?"

Pupil: "Two."

Teacher: "In what other way can I say that five and five are ten?"

Pupil: "You can say, 'two 5's are ten'."

Teacher: "When we want to say, 'two 5's are ten,' instead of writing it as I have written it here, we write it this way — 5 ×2. That means, two 5's are 10.

The sign in front of the 2, (x) tells that we mean, two 5's are 10. When we write this, 2 ×2 4, we mean, two 2's are 4."

The purpose here is not to give new arithmetical facts but to give old facts in new form and to acquaint the pupils in a limited way with the language and meaning of multiplication without the necessity of presenting any new facts.

Pupils should now discover that not only 5 $\frac{5}{10}$ but also $\frac{\begin{array}{c}2\\2\\2\\2\\2\end{array}}{10}$

Pupils will soon realize that no matter whether he writes $\begin{array}{r}5\\ \times 2\\ \hline\end{array}$ or $\begin{array}{r}2\\ \times 5\\ \hline\end{array}$
the same answer is obtained in either case.
That is no matter which number is written below with the sign x before it.

c. Review work taught.
   One place multiplier, no carrying. $\begin{array}{r}22\\ \times 3\\ \hline\end{array}$ $\begin{array}{r}42\\ \times 2\\ \hline\end{array}$

   Suggested activities for drilling these facts. Interesting games and
   devices for reviewing multiplication facts.

Test on multiplication facts:

7	4	5	5	1	6	2	3	1	7	2	2	8	0	0	3	1
2	1	2	1	2	1	2	1	3	1	3	1	2	1	2	2	4

2	4	0	3	9	0	8	1	1	4	6	5	8	7	9	9	4
0	2	3	0	1	0	1	0	1	0	2	0	0	0	0	2	3

7	9	8
3	3	3

Follow the same advice as is given for the addition facts.

IV. Division:

   Method:
          The division fact $3\overline{)27}^{\,9}$, should be read in some such form as 3's
   in 27, 9.

   The pupil should think of $3\overline{)27}$ as asking the question "How many 3's in
   27?"

   Avoid "3 goes into 27 how many times?"

   Facts to be taught:

   $2\overline{)2}$ $2\overline{)14}$ $3\overline{)24}$ $2\overline{)12}$ $3\overline{)3}$ $3\overline{)27}$ $3\overline{)12}$ $3\overline{)15}$ $2\overline{)10}$

   $2\overline{)8}$ $3\overline{)9}$ $2\overline{)16}$ $2\overline{)4}$ $3\overline{)18}$ $2\overline{)18}$ $2\overline{)6}$ $3\overline{)21}$

   How many 2's in 12?   How many 3's in 24?

   Read and give answers orally: $8 \div 2$ $21 \div 3$

                                  $2\overline{)8}$ $3\overline{)21}$. etc.

Teaching of Arithmetic in the Ele.entary School, Primary Grades,
R.L. Morton,
Silver Burdett Company.

I. Minimum Requirements   Units 9-10, Grade 3-1

    (At least three weeks review on work of previous grades)

    A. Reading and writing numbers.

        1. Reading and writing numbers to 1000.
        2. Reading and writing dollars $ and cents ¢ through $10.00 using
            $ and point.

    B. Fundamental processes

        1. Addition and its vocabulary.
            a. Review facts from 12 - 20.
            b. Single column addition to 20.
            c. Two figure and three figure addition, with carrying no more
               than three addends.

        2. Subtraction and its vocabulary.
            a. Corresponding subtraction facts.
            b. Subtraction of two figure numbers without borrowing.

        3. Multiplication and its vocabulary.
            a. Review 2's and 3's.
            b. Multiplication facts corresponding to table of 4's
               including reversals.
            c. Multiplication of two figure numbers with carrying using
               tables taught.

        4. Division and its vocabulary.
            a. Simple division by 4's with 2 and 3 figure dividends, no
               remainders, no carrying.
            b. Zeros in dividend.

    C. Measures - Review pint, quart, gallon, inch, foot, yard, dozen,
      ½ dozen, ½ gallon.

    D. Social Uses of Arithmetic

        1. Use of numbers in activities such as: keeping scores in games,
            making change, telling time, use of index, concept of 1/2,
            1/3, 1/4, 1/5.

        2. Value of 1 quarter, 1/2 dollar, and dollar.

    E. Problem Solving

        1. Reading problems to obtain concepts of such words as sum,
          difference, total, take away, how much more, less than, product.

        2. Oral and written problems involving addition and subtraction
            facts to 20.

    F. Diagnostic and Remedial Work
        Attainment Tests and various Diagnostic Tests.

I. Minimum Requirements   Units 11-12,   Grade 3-2

   A. Reading and writing numbers.

       1. Reading and writing numbers to 5 digits or 10,000.
       2. Review reading and write $'s and cts. through $10.00.
       3. Reading and writing Roman numerals through XX without bars.

   B. Fundamental processes.

       1. Addition and its vocabulary.
          a. Addition by e.dings -- in sequence.
          b. Addition of $'s and cts. through $10.00.

       2. Subtraction and its vocabulary.
          a. Subtraction of $'s and cts. to $10.00.
          b. Subtraction of three figure numbers without borrowing.

       3. Multiplication and its vocabulary.
          a. Review tables, multiplication facts corresponding to
            table of 5's and 6's and reversals.
          b. Multiplication of three figure numbers with carrying
            using one figure multiplier.
            Simple examples using two figure multiplier.
            Zero difficulties.
          c. Multiplication of $'s and cts. through $10.00 by one
            figure multiplier.

       4. Division and its vocabulary.
          a. Simple division by 6's. Same as listed in 3-1.

   C. Measures

       1. Continuation of 3-1.

   D. Social Uses of Arithmetic

       1. Continuation and development of 3-1 social uses.
       2. Concept of 1/6.

   E. Problem solving.

       1. Easy one step problems involving the four processes.

   F. Diagnostic and Remedial work.

      Attainment Tests and various Diagnostic Tests.

Review all work of previous grade.

Numbers   – Reading and writing to 1000.
                     Reading and wr iting dollars and cents through ten dollars
                     using dollar sign and ddcimal poi nt.

Addition   – Facts 12–20 (Review).
                     Single column through 20.
                     Two figure and three figure with carrying no more than
                     three addends.

Subtraction   – Facts 12–20 (Review).
                     Two figure numbers without borrowing – with gaps.

Multiplication –   Facts corresponding to tables of 4's.
                     Two figure numbers without carrying using facts taught.

Division   – Using facts taught in tables.

Second Report Card Period   Unit X

Addition   – Facts 12–20 (Review),
                     Single column through 20.
                     Two figure and three figure numbers with carrying – no
                     more than three addends.

Subtraction   – Facts 12–20 (Review)
                     Two figure numbers without borrowing. With gaps as $\begin{array}{r} 68 \\ -\ 8 \\ \hline \end{array}$

Multiplication – Facts corresponding to tables of 5's.   Two figure
                     numbers with carrying, using facts taught.

Division   – Facts corresponding to tables of 5's. Using two and
                     three figure dividends – no remainders – no carrying –
                     zeros in dividend.

Measures   – As stated in outline – pint, quart, gallon, ½ gallon,
                     inch, foot, yard, dozen, ½ dozen.

Problems   – As stated in outline.

Social Uses   – As stated in outline.

Review all work of previous units.

Numbers — Reading and writing to 5 digits or 10,000.

Addition — By endings.
Dollars and cents through ten dollars using dollar sign and decimal point.
Roman numerals through XX - without bars.

Subtraction — Dollars and cents through ten dollars.
Three figure numbers without borrowing but with gaps as

$$346 \qquad 975$$
$$\underline{-23} \qquad \underline{-4}$$

Measures — As stated in outline - minute, hour, hours in day.
A continuation of Units IX, X - days, week, months, year.

Multiplication — Facts corresponding to table of 6's.
Three figure numbers with carrying using 1 figure multiplier.
Simple examples using two figure multipliers and including zero difficulties.

Division — Facts corresponding to table of 6's.
Use 2 and 3 figure dividends - no remainders - no carrying - zeros in dividend.

Fourth Report Card Period   Unit XII

Addition — Review dollars and cents through $10.00, using $ sign and decimal point.

Subtraction — $ and ¢ through $10.00.
Three figure numbers without borrowing.
Check by adding.

Multiplication — Teach two figure multipliers include zero difficulties.

Division — Teach long division method. Use two and three figure dividends, no carrying, no remainders, zeros in dividend.
(Facts corresponding to tables taught. 2's to 6's.)

Problems — Easy one step problems involving the four processes.

Social Uses — Suggestions as stated in outline to be correlated with other work throughout the semester.

I. Minimum Requirements in detail

A. Reading and Writing Numbers

    1. Review second grade.

    2. Introduce as new work Arabic Numbers to 5 digits or 10,000.
        a. Teach reading and writing numbers according to place value.
        Look at these numbers and see how the figure changes its value.

Thousands	Hundreds	Tens	Units or Ones
			4
		4	0
	4	0	0
4	Numbers replacing zeros	6	0
		6	2

In other words 4 means 4 units.
In next number (40) means 4 tens.
In next number (400) means 4 hundreds.
In next number (4000) means 4 thousands.
A child should be taught that a zero can be replaced by a
number, and that number takes on the name of the place in
which it stands.

Thousands	Hundreds	Tens	Units or Ones
8	8	4	3
	3	1	0
	3	0	1

The numbers when they are written read—
    8 thousand 843
    8 hundred 43
    3 hundred 10
    3 hundred 1
Never say "and" in reading whole numbers.

        b. Before leaving third grade, a child should be able to analyze
        a four place number in this way.
            3 462   3 thousand
            462 4 hundreds, or 400 (four hundred)
            and 6 tens,   or 60 (sixty)
            and 2 ones,   or   2 (two)
                        462 or four hundred sixty-two.

        c. Suggested practices:
            1 - Read these numbers: 8; 78; 843; 708; 650; 900; 2,050;
               3,489
            2.- Write these numbers in words and vice-versa: 106; 601;
               160; 464; 300; 2,010; 8,567.
            3 - Write the above numbers in order.
               Begin with the smallest or largest.

4 - Match the following:
      (a) 615   1. one hundred forty
      (b) 300   2. three hundred
      (c) 204   3. six hundred fifteen
      (d) 140   4. two hundred four

5 - 3864 means _____ thousands, _____ hundreds, _____
tens, and _____ ones.

3. Dollars and Cents
  a. Writing dollars and cents through two orders to the left of
    the point.
      1. 4¢ introduced as $.04
      2. 55¢ as $.55, etc.
      3. 1 dollar as $1; $1.; $1.00
      4. $5.95; $9.50; $3.05
  b. Reading dollars and cents through $10.00.

4. Roman Numerals
  a. Reading to 20
  b. Writing to XX (no bars)

B. Fundamental Process

1. Addition
  a. Vocabulary
      sum   total
      plus   amount

  b. Test - addition facts taught in second grade.
    Master these new facts.

9	7	8	6	9	8	9	5	4	4	5	7	8
9	7	8	6	3	4	4	9	8	9	7	5	9

7	9	6	9	8	8	9	6	5	8	7	7	9
6	5	9	8	7	5	6	8	8	6	8	9	7

It is suggested that these facts be mimeographed (hectographed)
and given for diagnostic purposes. For remedial work it would
be advisable that these facts be run off with the answers and
put into the hands of the children.

  c. Addition by endings
    In sequence:

3	3	3	3	3	3	3
1	11	21	31	2	12	22

    Not in sequence:

63	3	93	43
2	2	2	2

    Reverse combinations:

3	4	3	5
24	33	15	43

    Adding up endings with carrying:

5	5	5	5
7	17	27	37

    Suggested activities:
      Add 3 to each: 9, 6, 14, 20, 16, 18, 49.

18.

Add 6 to each number as you read.

8   18   28   3 8   48   58   68   78   88   98

Watch the tens' figures in addition.

29	86	57	47	79	18
3	8	9	4	3	9

Department of Public Instruction, Commonwealth of Pennsylvania,   Bulletin 360,
Quantitative _Aspects_ _of_ _Experiencing_ _in_ _the_ _Elementary_ _School,_   pp. 61-62.

d. Addition to three orders

735	892
415	697
123	9
314	34

Add down.

735 + 415 + 123 + 314 =

892 + 697 + 9 + 34 =

19 plus 64 =

Add 56   452   980   etc.

Add 46   305   217   etc.

e. Addition of dollars and cents .
   Limit it to examples with addends not larger than two figures
   for the dollars as $10.99.

f. Checking
   Check by adding up.

2. Subtraction
   a. Vocabulary
        subtract   take _from_
        difference   how much is left
        minus   more than
        change received   less than
                              fewer than

   b. Test facts taught in second grade
      Master the following new facts:

12	14	12	12	13	12	12	16	12	18	14
8	7	9	7	6	3	4	8	5	9	8

15	14	15	13	13	13	13	16	15	15	13
8	6	6	7	5	8	9	7	7	9	4

17	14	17	16	14	12
9	5	8	9	9	6

Follow the same advice as given for the addition facts.

c. Teach two place numbers without borrowing:

   76   Say 4 from 6 = 2
   24   2 from 7 = 5

Teach in all forms stated below:

Subtract 24 from 76
Find the difference between 24 and 76
76 - 24 =

```
76 minus 24
Take 24 from 76
Subtract 76          76
         24         -24
```

Simple subtraction, no norrowing, zero in answer.

```
793        793        793
392        383        683
```

Gaps, no borrowing:

```
68      59      346      975
 8       2       23      - 4
```

Subtraction of Dollars and Cents.
Limit it to examples with addends not larger than a two figure for
the dollars.

3. Multiplication:
(The sign "x" should be read times.)

a. Vocabulary
        times
        carrying
        product

b. Test facts taught in second grade.
   <u>Master</u> these new facts.

```
3    7    6    0    8    5    1    2    9    4    4    4    4    4
x4   4    4    4    4    4    4    4    4    4    8    9    7    6

4    2    7    0    5    1    3    6    8    7    6    7    8    9
5    5    4    5    5    5    5    5    5    5    6    6    6    6

9    6    6    6    0    6
5    7    8    9    6    0
```

c. One-place multiplier, no carrying

```
22        222        $.44
x3         x3         x2
```

One-place multiplier, with carrying

```
55        $7.72
x4          x5
```

One-place multiplier, zero in multiplicand, with carrying.

```
505        550
 x4         x4
```

Two place multipliers with carrying

```
33      62      78      55      28      90      56
x22     x44     x43     x24     x55     x35     x40
```

```
both     56        205       250
forms   x 40        x43       x52
```

In introducing zeros on the end, use both forms. Teach the shorter
form with the zero extended beyond the multiplicand last.

d. In the second grade you had 20 of the 100 multiplication facts. Here are the new facts to be taught in the third grade.

4 x 4 = 16	4 x 3 = 12	4 x 5 = 20	4 x 9 = 36
4 x 7 = 28	4 x 6 = 24	4 x 8 = 32	4 x 2 = 8
4 x 1 = 4	4 x 0 = 0	5 x 5 = 25	5 x 2 = 10
5 x 4 = 20	5 x 8 = 40	5 x 3 = 15	5 x 6 = 30
5 x 9 = 45	3 x 7 = 35	5 x 0 = 0	5 x 1 = 5
6 x 0 = 0	6 x 1 = 6	6 x 6 = 36	6 x 7 = 42
6 x 8 = 48	6 x 9 = 54		

Suggested activities for drilling these facts:

Interesting games and devices for reviewing multiplication tables.

Morton, R.L., _Teaching Arithmetic in the Elementary School, Primary Grades_, Silver Burdett Co.

Test multiplication facts.

Easier Facts

1	4	5	5	1	2	3	1	2	2	8	0	3	3
5	1	2	1	2	2	1	3	3	5	2	1	2	3

4	7	2	0	1	2	0	4	0	3	3	5	9	0
5	2	1	2	4	0	5	2	3	4	0	5	1	0

5	2	8	1	0	1	4	4	5	3	0	6	6	7
3	4	1	0	4	1	0	4	0	5	6	0	6	6

8	9	1	6
6	6	6	1

Harder Facts

6	9	5	4	7	7	6	9	8	8	8	6	9	7
3	2	4	3	3	5	4	3	3	5	4	5	4	4

Follow advice given for the addition facts at the end of Sec. B 1. b,.

e. Rationalization of multiplication. Where attempts are made to teach the children why the second partial product is set one place to the left as a step in teaching how to multiply by a two-place multiplier, this plan is used. The multiplier is broken into its units and 10's value, and each is multiplied by separately.

In the examples:

```
  242                                242        242
   42   two separate examples          2   and   40
                                     ----      -----
                                      484       9680
```

are done. The product of the multiplication by the 10's is added to the result obtained from multiplying by the 2, thus:

```
  242
   42
 -----
  484
 9680
```

It is shown that since the left hand figure is always a value of 10 or a multiple of 10, the product resulting from using it as a multiplier will end in zero. Therefore a space is left for the zero by treating the left hand figure as a separate multiplier and setting the second partial product one place to the left. Multiplication by a two-place multiplier ending in zero should be the first two-place multiplier taught if the above rationalization is used.

Wilson, Stowe, and Dalrymple, _Teaching the New Arithmetic_, McGraw Hill Book Company, Inc.

4. Division

    a. Vocabulary
       division
       divide
       divided by
       how many

    b. Test facts taught in second grade.

    c. <u>Master</u> the following new facts:

$$4\overline{)20} \quad 5\overline{)10} \quad 4\overline{)12} \quad 5\overline{)15} \quad 4\overline{)16} \quad 5\overline{)0} \quad 5\overline{)20} \quad 5\overline{)25}$$

$$4\overline{)8} \quad 4\overline{)36} \quad 5\overline{)30} \quad 5\overline{)35} \quad 4\overline{)0} \quad 5\overline{)45} \quad 5\overline{)5} \quad 4\overline{)32}$$

$$5\overline{)40} \quad 4\overline{)28} \quad 4\overline{)20} \quad 6\overline{)36} \quad 6\overline{)42} \quad 6\overline{)54} \quad 6\overline{)0} \quad 6\overline{)6} \quad 6\overline{)48}.$$

    d. Teach three figure dividends involving zero difficulties with no
       remainders and no carrying.

$$4\overline{)400} \quad 2\overline{)208} \quad 3\overline{)369} \quad 3\overline{)960}$$

    e. Suggested activities.
       Read and give answers orally:

$$6 \div 4 = \quad 18 \div 3 = \quad 10 \div 2 = \quad 30 \div 5 =$$

$$4\overline{)48} \quad 3\overline{)27} \quad 2\overline{)18}$$

       Read and fill in blanks:

$$24 = \underline{\hspace{2cm}} 4\text{'s} \quad 35 = \underline{\hspace{1cm}} 5\text{'s} \quad 18 = \underline{\hspace{1cm}} 3\text{'s} \quad 10 = \underline{\hspace{1cm}} 2\text{'s}$$

    f. Teach meaning of division facts as:

$$\tfrac{1}{2} \text{ of } \underline{\hspace{1.5cm}} \quad 1/3 \text{ of } \underline{\hspace{1.5cm}} \quad 1/4 \text{ of } \underline{\hspace{1.5cm}} \quad 1/5 \text{ of } \underline{\hspace{1.5cm}}$$

C. Denominate Numbers

    Review measures taught in previous grade.
    Teach:

    $\tfrac{1}{2}$ inch   60 min. = 1 hr.   7 days = 1 week
    1 gal.   24 hr. = 1 day   12 mos. = 1 year

I. Minimum Requirements

    A. Reading and writing numbers

        1. Review work taught in previous grade
        2. Arabic numbers through 5 digits
        3. United States money reading through $99,999 – writing through $9,999
        4. Roman numerals (omit top and bottom enclosure lines except for I, II, III)
            a. Reading through C
            b. Writing through L

    B. Fundamental processes

        1. Addition
            a. Vocabulary
            b. Test 100 addition facts
            c. Review addition by endings
            d. Adding through four orders
            e. United States Money
            f. Checking

        2. Subtraction
            a. Vocabulary
            b. Test 100 subtraction facts
            c. Review work taught in previous grade
            d. Subtract through four orders
            e. Borrowing with all difficulties through four orders. Stress
            f. United States Money
            g. Checking

        3. Multiplication
            a. Vocabulary
            b. Test 54 multiplication facts
            c. Review work taught in previous grade
            d. Complete multiplication facts (12 harder facts)
            e. Test 100 multiplication facts
            f. Rationalization of multiplication
            g. Three figure multipliers including zero difficulties
            h. United States Money
            i. Checking

        4. Division
            a. Vocabulary
            b. Test 40 division facts
            c. Review work taught in previous grade

d. Complete division facts
e. Test 90 division facts
f. Major difficulty steps for examples having one digit divisors (remainders to be written fractionally.)
g. United States Money
h. Checking

C. Fractions

1. Concepts in meaningful situations built on fractional parts of a whole (oral only) such as $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{1}{9}$ of a whole

D. Decimals

1. Unites States money in all four fundamental processes.

E. Denominate Numbers

1. Review work taught in previous grade
2. Measures
   a. Linear - mile
   b. Dry - peck and bushel
   c. Weight - ton
   d. Time - weeks, months, year
   e. Temperature - reading the thermometer
   f. Counting - dozen
   g. Concept of circle, triangle (square & oblong)
   h. Line graphs - scores on subject matter

F. Problem Solving

1. One-step meaningful problem

G. Avoid crutches.

	Reading and Writing Nos.	Fundamental Processes	Fractions	Denominate Numbers	Problem Solving
1st month September	Review work of 3rd grade. New work – Teach reading and writing Arabic numbers thru 4 digits. Teach U.S. money – reading thru $10,000 and write thru $9,999	Review addition, subtraction, multiplication and division facts and all 4 processes taught in third grade	Review fractional concepts in connection with multiplication & division facts	Review third grade work Line graphs (scores on subject matter)	Review third grade work on 1 step problems in connection with four fundamental processes
2nd month October	Roman Numerals – Teach reading and writing thru 25	Addition vocabulary Test addition facts. (100) Review adding by endings. Column addition thru 3 orders, including U.S. money. Add down. Check by adding up.		Table of Time and Calendar	One step addition problems
3rd month November	Periodical Review	Subtraction Vocabulary. Test 100 facts. Review third grade work. New–borrowing with all difficulties thru 3 orders. Checking.		Linear measure (inch, foot, yard, mile)	One step addition and sub–problems
4th month December	Review	Multiplication Vocabulary. Test 79 facts. Review 3rd grade work. Teach multiplication and division facts which correspond to tables of 7's. Continue multiplication by 2 figure multipliers using facts learned. Checking. Review easy division by one digit with 2 & 3 digit quotients using multiplication and division facts learned up to this point. No carrying. Checking.	Build up fractional concepts with new multiplication and division facts	Table of Weight Ounces and Pounds	One step multiplication problems. Review addition, and subtraction. Include U.S. money

	Reading and Writing Nos.	Fundamental Processes	Fractions	Denominate Numbers	Problem Solving
5th month January	Review all term's work	Multiplication & division facts which correspond to tables of 8's. Test 75 division facts. Continue division & teach division facts with remainders	Fractional concepts of new multiplication and division facts.	Review	Review problems in all 3 processes including U.S. money
2nd term – 6th month February	Teach reading & writing Arabic numbers thru 5 digits. Reading U.S. money thru $99,999. Writing thru $9,999	Addition & subtraction thru 4 orders including $ & ¢ Multiplication & division facts which correspond to tables of 9's. Continue easy division and division facts with remainders.	Fractional concepts of new multiplication and division facts.	Liquid measure (pint, quart, gallon) Dry measure (pint, quart, peck, bushel)	One step problems all 3 processes. Use denominate numbers in problems.
7th month March	Roman Numbers Read thru C. Write thru L.	Multiplication & division facts which correspond to tables of 9's. Division long way. Divisor contained in first 2 digits Test 90 division facts. Vocabulary. Checking.	Fractional concepts of new multiplication and division facts.	Counting 12 things – 1 doz. Money	One step problems in division
8th month April	Reading answers	Long division by one digit divisors involving carrying with and without remainders. Checking		Temperature reading of the thermometer	One step problems in all 4 processes
9th month May	Reading answers	Long division zero difficulties and U. S. money in dividends. Checking. Multiplication using 3 figure multipliers including zero difficulties and money. Checking.		Concept of circle, triangle, rectangle (oblong & square)	One step problems in all 4 processes
10th mo. June	Review all work.	Review	Review	Review	Review

II. Minimum Requirements in Detail

A. Reading and Writing Numbers

1. Review:

   a. Before beginning a study of four and five place numbers, a fourth grade child should be able to analyze a three place number in this way.

   $$\underline{462}$$

462 = 4 hundreds	or 400	(four hundred)
and 6 tens,	or 60	(sixty)
and 2 ones,	or 2	(two)
	462	or four hundred sixty two.

2. Introduce as new work Arabic numbers through five digits.

   a. Teach reading and writing numbers according to place value. Look at these numbers and see how the figure changes its value.

Thousands	Hundreds	Tens	Units or Ones
			4
		4	0
	4	0	0
4	0	0	0
Numbers re-	6	0	0
placing zeros	6	2	8

   In other words, 4 means 4 units.
   In the next number (40) 4 means 4 tens.
   The next number is 400. In this number 4 means 4 hundreds. In the next (4000) 4 means 4 thousands.

   b. A child should be taught that a zero can be replaced by a number, and that number takes on the name of the place in which it stands.

Billions Same			Millions Same			Thousands H. Tens		Units Ones	Hun- dreds	.'ens	Units or Ones
							6	9	8	4	3
					2	5	0	6	3	1	0
	1	6	0	0	9	4	6	0	0	0	

   Grade 6 / Grade 5 / Grade 4

The numbers when they are written read:

	69 thousand,	843
2 million,	506 thousand,	310
1 billion, 600 million,	946 thousand,	000

Never say "and" in reading any whole number.

c. Suggested Practices:

   (1) Read these numbers
      843; 1,682; 29,600; 30,602

   (2) Write these numbers in words and vice-versa.
      69,106; 2,803; 1467; 9,000

   (3) Write these numbers in order.
      Begin with smallest, or largest.

   (4) Match the following:
      (a) 4,615   1. three thousand, one hundred four
      (b) 6,800   2. two thousand
      (c) 2,000   3.
      (d) 3,104   4.

   (5) 2,864 means _____ thousands, _____ hundreds, _____ tens, and _____ ones.
      (This practice is of value for numbers up to and including four orders.)

   (6) Practice reading an address, a date, and a telephone number such as on a permanent record card.
      Date of birth, April 6, 1926
      Address 2650 Plum Street
      Telephone 0-5221
      License plates P G 611

      Sometimes 2517 is read "twenty-five hundred seventeen".
      Then the word "thousands" is not used.

  3. United States Money
    a. Writing United States Money through four orders to the left of the point.
      (1) 4¢ introduced as $.04
         Extensive practice up to $.10
      (2) 55¢ as $.55; 99¢ as $.99
      (3) 1 dollar as $1; $1.; $1.00
      (4) $5.95; $15.02; $205.06
         Note: Due to errors such as these $1,5.02; $2,05.06, stress proper placing of comma in United States Money.

4. Roman Numerals
  a. Reading through 100.
  b. Writing through 50. Omit top and bottom inclosure line
         except for I, II, III

B. Fundamental Processes:

1. Addition
  a. Vocabulary
        addends   total amount
        sum   plus
  b. Test 100 addition facts

50 easier facts

```
0  5  2  3  1  3  1  6  7  1  8  2  0  0
0  5  2  3  2  1  1  1  1  6  1  9  4  2

1  1  8  4  9  4  7  2  0  5  8  6  1  8
4  3  2  5  9  4  7  3  5  1  8  6  7  0

9  0  9  4  4  1  5  2  1  2  1  3  5  2
2  6  1  1  2  9  2  7  8  8  0  4  4  4

2  2  5  9  2  0  4  3
0  1  0  3  6  1  6  8
```

50 harder facts

```
3  0  4  0  9  6  0  7  1  3  0  6  4  8
0  3  0  8  0  3  7  0  5  2  9  0  3  3

3  5  2  3  7  4  8  3  5  3  4  7  6  6
9  3  5  5  2  7  4  7  6  6  8  3  2  5

7  6  9  6  5  4  5  7  8  7  9  6  9  8
4  7  4  4  9  9  7  5  9  6  5  9  8  7

8  9  6  5  8  7  7  9
5  6  8  8  6  8  9  7
```

It is suggested that this test be mimeographed (hectographed)
and given for diagnostic purposes. For remedial work it
would be advisable that the test be run off with the answers
and put into the hands of the children.

c. Review addition by endings. (1)
   In sequence:

$$\frac{\begin{array}{c}3\\1\end{array}}{} \quad \frac{\begin{array}{c}3\\11\end{array}}{} \quad \frac{\begin{array}{c}3\\21\end{array}}{} \quad \frac{\begin{array}{c}3\\31\end{array}}{} \quad \frac{\begin{array}{c}3\\2\end{array}}{} \quad \frac{\begin{array}{c}3\\12\end{array}}{} \quad \frac{\begin{array}{c}3\\22\end{array}}{}$$

   Not in sequence:

$$\frac{\begin{array}{c}63\\2\end{array}}{} \quad \frac{\begin{array}{c}3\\2\end{array}}{} \quad \frac{\begin{array}{c}93\\2\end{array}}{} \quad \frac{\begin{array}{c}43\\2\end{array}}{}$$

   Reverse combinations:

$$\frac{\begin{array}{c}3\\24\end{array}}{} \quad \frac{\begin{array}{c}4\\33\end{array}}{} \quad \frac{\begin{array}{c}3\\15\end{array}}{} \quad \frac{\begin{array}{c}5\\43\end{array}}{}$$

   Adding by endings with carrying:

$$\frac{\begin{array}{c}5\\7\end{array}}{} \quad \frac{\begin{array}{c}5\\17\end{array}}{} \quad \frac{\begin{array}{c}5\\27\end{array}}{} \quad \frac{\begin{array}{c}5\\37\end{array}}{}$$

(1) Suggested activities:
   Add 3 to each: 9, 6, 14, 20, 16, 18, 49

   Add 6 to each number as you read:
   8   18   28   38   48   58   68   78   88   98

   Watching the tens' figures in addition

29	86	57	47	79	18
3	8	9	4	3	9
2	4	6	1	2	7

   d. Addition to four orders

   6735   1892
   8415   697   Add down
   2123   9
   6314   5034

   6735 + 8415 + 2123 + 6314 =
   1892 + 697 +   9 + 5034 =

   19 plus 64 =

   e. Addition of U. S. Money.

      Limit it to examples with addends not larger than $99.99

   f. Checking:
      Check by adding up.

(1) Dept. of Public Instruction, Commonwealth of Pa., Bulletin 360, Quantitative Aspects of Experiencing in the Elementary School

(2) Subtraction:

a. Vocabulary

subtract	minus	moro than
difference	minuend	higher
		less
remainder	subtrohend	change received
~~take~~ away	how much is left?	borrowing

b. Tost 100 facts:

50 ousier facts

```
  0   5   3   7   1   8   3   4   5   6   4   9   9   3
  0   1   2   7   1   1   3   4   3   6   2   1   2   0
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

  5   6   5   9   6   3   2   7   6   9   4   8   4   5
  4   0   2   0   1   1   1   1   5   8   1   4   0   5
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

  5   6   4   2  10  10   6   2   7   6   7   8  10   9
  0   3   3   2   1   2   2   0   0   4   2   6   5   5
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

 11  12   8   1   8   7   7   9
  2   6   0   0   7   3   5   3
 ──  ──  ──  ──  ──  ──  ──  ──
```

50 harder facts

```
  7   8  10   9   8  12  10  10   9   9   8  10  10  11
  6   2   7   7   6   8   6   4   4   6   3   9   3   7
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

 14   9   7  12  11  10  11  12  11  13   8  12  11  12
  7   2   4   9   5   8   3   7   6   6   5   3   9   4
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

 10  11  12  18  11  14  15  14  15  13  13  13  13  16
  8   8   5   9   4   8   8   6   6   7   5   8   9   7
 ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──  ──

 15  15  13  17  14  17  16  14
  7   9   4   9   5   8   9   9
 ──  ──  ──  ──  ──  ──  ──  ──
```

Follow advice given for the addition facts at the end of Sec. 1b, page 29.

c. Review work of previous grades. Two place numbers, without borrowing.

```
76
24
──
```

Toach in all forms stated below.

From 76 subtract 24
Subtract 24 from 76
Find the difference between 24 and 76
76 – 24
76 minus 24
76 take away 24
Take 24 from 76

```
Subtract   76    76
           24   -24
           ──   ───
```

Simple subtraction, no borrowing, zero in answer.

793	793	793
392	383	683

Gaps, no borrowing

68	59
8	2

d. Introduce subtraction through four orders, with all difficulties except borrowing.

2426	7948	4079	9365
1104	6903	1021	331

e. Borrowing with all difficulties through four orders.
Take Away-Borrow method is to be adopted for the entire city.

METHOD: Take Away - Borrow

Jim had $.63. He spent $.25 for a kite. How much did he have left? To find the answer, subtract.

$.63
.25
——

You cannot take $.05 from $.03. Why?
Change 63¢ to 5 dimes and 13 pennies.
Now subtract, 5 from 13 = 8.
Write 8 in ones' place in the remainder.
2 from 5 = 3. Write 3 in tens' place in the remainder.
The remainder is $.38.

Teach with real money, if you have it.

---

(1) Number Stories Book III Studebaker, Findley, Knight, Ruch
Scott Foresman & Co.

47
-38

Remember to change 47 to 3 tens and 17 ones.

436
-354

Think, 4 from 6 = 2 Write 2 in the difference
5 is more than 3. Change 4 to 3, think of the 3 as 13.
Think 5 from 13 = 8 Write 8;
Think 3 from 3 = 0   Do not write 0
The difference is 82.

503
-384

Subtract as you do with other numbers.
You cannot take 4 from 3. You
cannot take a 10 from 0 to change 3 to 13.
Take a 1 from 5.
Think of 5 as 4 and the 0 as 10. Then take a 1 from this ten.
Think of 10 as 9 and the 3 as 13. Now subtract.

4 from 13 = 9
8 from 9 = 1
3 from 4 = 1

Follow the same method as the above for subtraction all
difficulties to four orders. Refer to page 62.

f. Review all difficulties in subtraction using United States mono.

g. Checking:
Teach checking from the beginning.

```
  76
  24
  52
  76
```

(3) Multiplication (the sign X should be read times.)

a. Vocabulary
  multiplicand   carrying
  multiplier   times
  partial product
  product

b. Test 79 multiplication facts.
  (This includes all multiplication facts up through the tables
    of 6's)

```
1  4  5  5  1  6  2  3  7  9  5  7  6  4  0  8  8  7  6  5
0  1  1  0  2  1  3  4  4  2  3  2  4  3  4  2  4  3  2  4

5  3  1  6  0  1  6  7  4  8  6  9  2  0  3  5  0  0  6  6
8  1  1  8  1  6  7  6  0  6  9  6  0  5  0  7  0  6  0  6

      0  4  1  9  2  3  5  6  9  4  8  1  3  2
      3  2  4  3  4  3  2  3  4  4  3  3  2  2

      1  0  4  3  2  4  2  4  3  4  4  2  3  2
      2  2  8  7  9  9  8  7  9  6  5  7  8  5

         3  2  9  5  1  3  6  7  5  8  5
         6  6  5  6  5  5  5  5  9  5  5
```

c. Review work taught.
  One-place multiplier, no carrying

```
  22        222         $.44
  x3         x3          x2
```

  One place multiplier, with carrying

```
  55        $7.72
  x6          x5
```

  One place multiplier, zero in the multiplicand, with carrying.

```
  505       550
   x6        x4
```

Two place multipliers with carrying

33	62	78	55	28
x22	x44	x43	28	55

90	56 both	56	205	250
x29	x40 forms	40	47	47

In introducing zeros on the end, use both forms. Teach the
shorter form with the zero extended beyond the multiplicand, last.

d. In the third grade you had all but 21 of the 100 multiplication
facts. Here are the last 21 facts given below.

8 x 0 = 0	7 x 1 = 7	1 x 9 = 9	7 x 9 = 63
7 x 7 = 49	1 x 7 = 7	9 x 1 = 9	9 x 7 = 63
8 x 8 = 64	1 x 8 = 8	7 x 8 = 56	8 x 9 = 72
9 x 9 = 81	8 x 1 = 8	8 x 7 = 56	9 x 8 = 72
0 x 8 = 0	0 x 9 = 0	0 x 7 = 0	9 x 0 = 0

7 x 0 = 0

(1) Suggested Activities for drilling these facts. Interesting
games and devices for reviewing multiplication tables. (1)

_____

(1) Morton, R. L. Teaching Arithmetic in the Elementary School,
Primary Grades, Silver Burdett Co.

"Winging Wild Geese"
"Number Wheel"
"Three times ten plus eight"
"Seven times three plus nine"
"Ring Toss Game"
 Number Game
 Base Ball Diamond

e. Test on 100 Multiplication Facts.

50 easier
facts

1	4	5	5	1	6	2	3	1	7	2	1	2	8
5	1	2	1	2	1	2	1	3	1	3	7	5	2

0	1	3	3	1	4	7	2	0	1	2	0	4	0
1	6	2	3	9	5	2	1	2	4	0	5	2	3

3	3	2	0	5	9	0	5	0	1	6	2	8	1
4	0	7	8	5	1	0	3	6	8	0	4	1	0

0	1	4	4	6	5	2	3
4	1	0	4	2	0	8	5

50 harder
facts

6	8	5	0	7	2	9	0	2	9	5	4	3	7
3	0	6	9	0	9	0	7	6	2	4	3	6	5

76

3	9	7	4	9	7	6	5	9	8	6	8	5	8
7	9	3	6	5	7	4	7	3	3	6	5	9	4

3	6	4	9	8	5	7	6	3	6	7	4	8	4
9	5	7	4	8	8	4	8	8	7	6	9	6	8

8	8	9	6	9	7	9	7
9	7	8	9	7	8	6	9

Follow advice given for the addition facts at the end of Sec. 1 b, page 29.

f. **Rationalization of Multiplication**

Where attempts are made to teach the children why the second partial product is set one place to the left as a step in teaching how to multiply by a two-place multiplier, this plan is used. The multiplier is broken into its units and 10's value, and each is multiplied by separately. In the example:

242
_42_, two separate examples

$$
\begin{array}{r} 242 \\ 2 \\ \hline 484 \end{array}
\quad \text{and} \quad
\begin{array}{r} 242 \\ 40 \\ \hline 9680 \end{array}
$$

are done. The product of the multiplication by the 10's is added to the result obtained from multiplying by the 2, thus

$$
\begin{array}{r} 242 \\ 42 \\ \hline 484 \\ 9680 \end{array}
$$

It is shown that since the left hand figure is always a value of 10 or a multiple of 10, the product resulting from using it as a multiplier will end in zero. Therefore a space is left for the zero by treating the left hand figure as a separate multiplier and setting the second partial product one place to the left. Multiplication by a two-place multiplier ending in zero should be the first two-place multiplier taught if the above rationalization is used.

g. Three figure multipliers including zero difficulties.

$$
\begin{array}{r} 216 \\ \times 124 \end{array}
\qquad
\begin{array}{r} 405 \\ \times 284 \end{array}
\qquad
\begin{array}{r} 370 \\ \times 286 \end{array}
\qquad
\begin{array}{r} 456 \\ \times 170 \end{array}
\qquad
\begin{array}{r} 584 \\ \times 405 \end{array}
$$

$$
\begin{array}{r} 308 \\ \times 407 \end{array}
\qquad
\begin{array}{r} 740 \\ \times 508 \end{array}
\qquad
\begin{array}{r} 807 \\ \times 370 \end{array}
\qquad
\begin{array}{r} 576 \\ \times 300 \end{array}
$$

h. Teach all above difficulties using United States Money. (dollars and cents)

i. Checking: Interchange multiplicand and multiplier.

1* Wilson, Stone and Dalrymple; Teaching the New Arithmetic, McGraw-Hill Book Co., Inc., 1939, p. 160

(4) Division
  a. Vocabulary

dividend	shared equally
divisor	divided equally
quotient	average

_____

  b. Test 75 division facts.

| 8)24 | 6)48 | 8)48 | 2)2 | 2)8 | 3)12 | 4)4 | 4)20 | 9)45 |

| 4)24 | 1)1 | 1)2 | 2)14 | 3)9 | 3)3 | 5)10 | 1)6 | 8)32 |

| 6)0 | 7)42 | 8)40 | 3)18 | 5)15 | 4)12 | 4)16 | 3)6 | 6)30 |

| 9)54 | 6)6 | 7)28 | 5)0 | 2)12 | 3)15 | 5)20 | 2)10 | 6)12 |

| 6)18 | 6)54 | 1)9 | 5)25 | 4)8 | 3)21 | 2)16 | 3)27 | 1)3 |

| 1)8 | 6)24 | 1)7 | 4)36 | 3)24 | 2)18 | 5)30 | 5)35 | 9)27 |

| 1)0 | 6)42 | 9)18 | 2)4 | 5)45 | 4)0 | 2)6 | 5)5 | 6)36 |

| 8)16 | 7)21 | 1)4 | 5)40 | 4)32 | 4)28 | 2)0 | 7)35 | 1)5 |

| 7)14 | 3)0 | 8)8 |

  c. Review work taught in previous grade.
     (1) Suggested activities:
         Read and give quotients orally:

         16 ÷ 4 =   10 ÷ 2 =
         18 ÷ 3 =   30 ÷ 5 =

         Name the divisor and dividend in each.
         Read and give quotients orally:

         4)48   3)27   2)68

36.

Give the answers of:

1/4 of 4 =   1/2 of 88 =   1/3 of 30 =

Read and fill in blanks:

24 = _____4's   35 = _____5's

18 = _____3's   10 = _____2's

Fill in quotients:

4)400   5)520   2)604

d. Complete 15 Division Facts.

7)0   7)7   7)49   7)56   7)63

8)0   8)56   8)64   8)72   9)0

9)36   9)63   9)72   9)81   9)9

e. Test 90 Division Facts:

2)2   7)7   8)24   9)9   5)5   8)64

6)48   4)28   4)4   8)48   4)24   1)1

9)63   4)0   1)2   4)36   5)0   6)0

7)49   9)0   7)42   8)40   3)3   9)54

9)36   8)72   6)6   2)0   7)28   6)18

8)56   7)0   7)63   3)24   6)54   8)0

3)27   9)72   1)9   1)8   4)16   5)20

6)24   5)45   1)7   2)8   1)0   6)42

4)12   2)12   3)6   9)18   5)40   3)15

4)32   8)16   7)21   2)14   2)18   1)4

3)21̅   5)10̅   4)8̅   4)20̅   5)30̅   2)6̅

7)56̅   1)6̅   3)12̅   9)81̅   9)45̅   8)32̅

5)15̅   3)9̅   6)30̅   5)35̅   6)12̅   2)10̅

1)3̅   9)27̅   6)36̅   5)25̅   7)35̅   1)5̅

2)16̅   2)4̅   3)18̅   7)14̅   3)0̅   8)8̅

Follow advice given for the addition facts in Sec. B 1 b, page 29.

f. Major difficulty steps for examples having one digit divisions:

(1) The primary division facts, as follows: 8)48̅

7)42̅   6)36̅

(2) Examples having two-digit and three quotients, no carrying.

(a) Divisor contained in first digit of dividend as

3)69̅   2)486̅   4)844̅

(b) Divisor contained in first two digits of dividend as

3)126̅   4)2484̅   6)3066̅

(3) The primary facts, with remainders, as

2)17̅   6)53̅   8)50̅

(a) Suggested drill

$2\frac{1}{6}$ $2\frac{1}{6}$ $2\frac{2}{6}$ $2\frac{3}{6}$ $2\frac{4}{6}$

6)12̅   6)13̅   6)14̅   6)15̅   6)16̅

6)17̅   6)18̅   7)28̅   7)29̅   7)30̅

7)31̅   7)32̅   7)33̅   7)34̅   7)35̅

8)32̅   8)33̅   8)34̅   8)35̅   8)36̅

8)37̅   8)38̅   8)39̅   8)40̅   9)45̅

9)46̅   9)47̅   9)48̅   9)49̅

(4) Examples involving carrying, with no remainders.
   (a) Two digit quotients as 6)84   4)172
   (b) Three digit quotients

   Carrying in first step only as:

   5)3755   7)3157   6)2826

   Carrying in second step only as:

   8)1696   3)1575   4)1664

   Carrying in both steps as:

   4)2532   9)3753   6)2532

(5) Examples involving carrying, with remainders, as:
   6)86   4)175   5)3757   8)1699   9)3758

(6) Zeros in quotient without and with remainders
   (a) At end of quotient, as:
      4)40   5)750   3)32   8)2643
   (b) In midst of quotient, as:

      6)1206   4)1612   9)5419   8)3218

g. United States Money in dividends only with money in answers.

   1. This should be used as each step is introduced in division.

h. Checking division by multiplying the quotient by the divisor, and adding in the remainder if there is one.

ex.

```
      212 3
          8
   8)1699          check    212
     16                      x8
      9                     1696
      8                      +3
     19                     1699
     16
      3
```

C. Fractions:

   1. Concepts in meaningful situations built on fractional parts of a whole.

      a. Division facts only; as:

         $\frac{1}{6}$ of 42 = 7   same as 6)42

         $\frac{1}{7}$ of 56 = 8   7)56

$\frac{1}{8}$ of 72 = 9   Same as $8\overline{)72}$

$\frac{1}{9}$ of 45 = 5   "   " $9\overline{)45}$

b. No fraction vocabulary introduced in this grade.

D. Decimals:

    1. United States money should be introduced in all four fundamental processes.

E. Denominate Numbers:

    1. Review work taught in previous grade

        a. Linear: inch, foot, yard

        b. Liquid: 1/2 pint, quart, gallon

        c. Dry: recognize peck and bushel baskets

        d. Money: all coins to one dollar

        e. Time: seconds, minutes, hours, days. Reading dates

        f. Weight: ounce (visualized)

    2. Measures:

        a. Linear - mile

            (1) Locate three or four places that are a mile away from the school building.

            (2) Ride a mile noting the amount of time it takes.

            (3) Walk a mile noting the amount of time it takes.

        b. Dry

            (1) Learn 8 quarts = 1 peck

                    32 qts. = 1 bu.

                      4 pks. = 1 bu.

        c. Weight - 16 ounces 1 lb.

               2000 lbs 1 ton

        d. Time: 7 days = 1 week

              30 days = 1 month

               4 weeks = 1 month

              52 weeks = 1 year

              12 months = 1 year

            365 days = 1 year

        e. Temperature: Teach the degree symbol - keep weather charts

        f. Counting: 12 things 1 dozen

                   12 dozen 1 gross

        g. Concept of circle, triangle, square and oblong - these only as a child will meet such figures in his daily life

h. Line graphs: Individual scores on subject matter – competitive class work - contributions,

F. Problem Solving in grade 4 limited to one step problems

The aims and suggestions for improvement of written problem work used here were taken from Teaching the New Arithmetic by Guy M. Wilson, McGraw-Hill Book Co., Inc. New York City. Part III in this same book is an excellent written problem unit.

1. Aims of written problem work.
   a. Objective thinking in terms of real life.
   b. Interpretation of real situations when encountered.
   c. Ability to apply and use number work when it is needed.

2. Suggestions for the improvement of written problem work,

   a. Isolated text problems as such should be entirely eliminated from the school room.
   b. Meaningful problem material involving the use of stories, descriptions, business view points and situations such as shopping trips, visits to stores, and farms - is the minimum basic requirement.
   c. A major proportion of the time on written problem work should be given to the development of real experiences.
   d. Life situations and real experiences, if developed properly, will become the basis for thinking, organizing and planning. The result of this should be an understanding of the real meaning of numbers as used outside of school in the child's daily life.

Bibliography:

Department of Public Instruction, Commonwealth of Pa., Bulletin 360, Quantitative Aspects of Experiencing in the Elementary School

Hildreth, Gertrude, Learning the Three R's, Educational Publishers Inc., Ch. XIV pp. 473-484

Morton, R. L., Teaching Arithmetic in the Elementary School, Silver Burdett Co. Book II Ch. II

1203-T

Important – Follow this Course of Study. Each teacher should have a desk copy of "Social Utility Arithmetic, Book 3" – Strayer Upton – American Book Company.

I. Minimum Requirements

    A. Reading and writing numbers
        1. Review work taught in previous grade
        2. Arabic Numbers through 7 orders
        3. United States Money through millions
        4. Roman Numerals

    B. Fundamental Processes
        1. Addition
            a. Review
                (1) Vocabulary
                (2) Review addition facts
                (3) Adding by endings
            b. Addition through higher orders
            c. United States Money
            d. Checking
        2. Subtraction
            a. Review
                (1) Vocabulary
                (2) Review subtraction facts
                (3) Review work of previous grade
            b. United States Money
            c. Checking
        3. Multiplication
            a. Review
                (1) Vocabulary
                (2) Review multiplication facts
                (3) Zero difficulties
            b. United States Money
            c. Checking
        4. Division
            a. Review
                (1) Vocabulary
                (2) Division facts
                (3) Division by one digit divisors
            b. United States Money
            c. Checking
            d. Six Steps in long division by 2 digit divisors.
            e. Difficulties and when presented
            f. Checking

    C. Fractions
        1. Introduction of fractions
            a. Vocabulary
            b. Review fractional concepts of previous grades
            c. New fractional concepts
                (1) Parts of a whole – meaning of a fraction
                (2) Terms of a fraction

2. Kinds of Numbers
    a. Whole numbers
    b. Proper fractions
    c. Improper fractions
    d. Mixed numbers
3. Reduction
    a. Proper fractions
    b. Improper fractions
4. Addition
    a. Like fractions
5. Subtraction
    a. Like fractions
6. Addition
    a. Unlike fractions
7. Subtraction
    a. Unlike fractions

D. Decimals
    1. United States Money

E. Denominate numbers
    1. Review work done in previous grades.
    2. Fractional parts

F. Problem Solving
    1. One step
    2. Two Question
    3. Finding Averages
    4. Making Change

G. Bar graphs

H. Avoid crutches.

.

II. Minimum Requirements

	Reading and Writing Numbers	Fundamental Processes	Fractions	Denominate Numbers	Problem Solving
1st month September	Review work of 4th grade. New Work: Teaching reading & writing Arabic Nos. thru 6 digits. Teach U.S. money reading to $100,000	Review addition, subtraction, multiplication & division facts & all 4 processes taught in 4th grade. Review vocabulary	Review fractional concepts in connection with multiplication & division facts	Line graphs as a temperature chart or on subject matter	Problems involving the use of the fundamental processes and U.S. money
2nd month October	Review Roman numerals by reading to C & writing to L dates incidentally as needed	Complete review of previous month Introduce long division. 1-Divisors 11 &12 2-Divisors 21 3-All divisors ending in 1,2,3, 4 or 5. Quotient figure always correct		Same	Problem solving involving long division
3rd month November	Periodical review	Division of: 1-U.S. money 2-Remainders 3-First difficulty - zeros 4-Second difficulty is lowering the quotient figure	Use your remainders as fractions		Problems involving work taught
4th month December	Periodical review	Division: 1-Review 2nd difficulty 2-Divisors ending in 6,7,8,9 3-3rd difficulty- remainder-raise quotient figure.			Problems involving work taught
5th month January	Periodical review	Review: 1-3rd difficulty 2-Using 9 as a quotient figure 3-Finding quotient figures at a glance 4-Divisors from 13 to 18 Review			One step problems

	Reading and Writing Numbers	Fundamental Processes	Fractions	Denominate Numbers	Problem Solving
6th month February	Review work of previous grade. New Work: Teach reading & writing Arabic nos. thru 7 orders. Teach U.S. money reading to $1,000,000	Review all four fundamental processes	Build up our fractional concepts and vocabulary. Reduction of proper & improper fractions. Kinds of fractions. Addition of like fractions of all types	Fractional parts eg: 6 in.= __ ft. etc.	One step problems involving fractional parts and reductions
7th month March	Review	Review	Subtraction of like fractions all types. Review addition by using same examples for both addition & subtraction	Review	Problems using fractions
8th month April	Review	Review	Addition and subtraction of unlike fractions - finding L.C.D	Review	Carry on problem work involving life situations
9th month May	Review	Review	Continue practice on all types in addition and subtraction of fractions	Review	One Step problems with two questions
10th month June	Intensive review	Intensive review and work with U.S. money, all processes	Intensive review	Review of fractional parts	Problems using fractions and fundamentals

I. Minimum Requirements in Detail

    A. Reading and writing numbers
        1. Review:
        2. Introduce as new work Arabic numbers through seven digits.
            a. Teach reading and writing numbers according to place
               value, as presented in the fourth grade outline in
               sections 2a, p. 27 and 2b, p. 27.
        3. United States Money
            a. Review:
            b. Reading United States Money as needed in every day
               situations.
        4. Roman Numerals – omit top and bottom enclosure lines – except
          in I, II, and III
            a. Using units tens and hundreds as a base, teach the
               larger ones as the children come in contact with
               them e. g. : dates

I = 1	XX = 20	CC = 200
II = 2	XXX = 30	CCC = 300
III = 3	XL = 40	CD = 400
IV = 4	L = 50	D = 500
V = 5	LX = 60	DC = 600
VI = 6	LXX = 70	DCC = 700
VII = 7	LXXX = 80	DCCC = 800
VIII = 8	XC = 90	CM = 900
IX = 9	C = 100	
X = 10		

    B. Fundamental processes
        1. Addition
            a. Review:
               (1) Vocabulary Gr. 4 Sec. B 1. a, p. 29 and page 65.
               (2) Test 100 addition facts
                   (a) as listed in Section B 1. b, p. 29
                      fourth grade outline or back of book page 60.
               (3) Adding by endings
            b. Addition through higher orders when necessary
            c. United States Money
               (1) Limit to examples within the child's knowledge
                   of money
            d. Checking
               (1) Check by adding up
         2. Subtraction
            a. Review:
               (1) Vocabulary Gr. 4 sec. B 2 a, p. 31 and page 65.
               (2) Test 100 subtraction facts
                   (a) as listed in Sec. B 2 b, p. 31 in fourth
                      grade outline or back of book page 61.
               (3) Review work of previous grade
                   (a) Take away-borrow method as presented in
                      Sec. b 2 e, p. 31 in 4th grade outline
            b. United States Money
               (1) Review all difficulties in subtraction using
                   United States money
            c. Checking
               (1) 76
                   24
                   52
                   76

3. Multiplication
    a. Review:
        (1) Vocabulary Gr. 4 Sec. B 3 a, p. 33
        (2) Test 100 multiplication facts
            (a) as listed in Sec. B 3 e pp. 33   in 4th
                grade outline.
        (3) Zero difficulties
    b. United States Money
        (1) Teach all difficulties using United States Money
    c. Checking
        (1) Interchange multiplicand and multiplier

$$
\begin{array}{c}
24 \\
\times 32 \\
\hline
48 \\
72 \\
\hline
768
\end{array}
\qquad
\begin{array}{c}
32 \quad \text{check}\\
\times 24 \\
\hline
128 \\
64 \\
\hline
768
\end{array}
$$

4. Division
    a. Review:
        (1) Vocabulary Sec. B 4 a, P. 36   Grade 4
        (2) Test 90 division facts as listed in Sec. B 4 b
            and 4 d in the fourth grade outline, pp. 36-37.
        (3) Division by one digit, with all difficulties
    b. United States Money
    c. Checking

NEW - Long division is the important new work in 5-1. We have found that the finest presentation of the subject of long division is in Social Utility Book 3, Ch. 2, pp. 47 through 91. The following are excerpts from the above:

Method for finding total divisor:

Rule I. For two figure divisors between 19 and 99 ending in 1, 2, 3, 4 or 5 divide the partial dividend by the first figure of the divisor to obtain a quotient figure.

21	31	41	51	61	71	81	91	
22	32	42	52	62	72	82	92	24 belongs to the 20
23	33	43	53	63	73	82	93	family because it is
24	34	44	54	64	74	84	94	closer to 20. The
25	35	45	55	65	75	85	95	trial divisor is 2.

Rule II. For two figure divisors between 19 and 99 ending in 6, 7, 8 or 9 each quotient figure is found by dividing the partial dividend by one more than the first figure of the divisor.

26	36	46	56	66	76	86	96	
27	37	47	56	67	77	87	97	88 belongs to the 90
28	38	48	58	68	78	88	98	family because it is
29	39	49	59	69	79	89	99	closer to 90. The
								trial divisor is 9

d. Six steps in long division
    (1) <u>Divide</u> the partial dividend by the divisor.
        Write the first figure of the quotient over the
        last figure of the partial dividend
    (2) <u>Multiply</u> the divisor by the quotient figure
    (3) <u>Compare</u> to see if you can subtract
    (4) <u>Subtract</u>
    (5) <u>Compare</u> to see if the remainder is smaller
        than the divisor
    (6) <u>Bring down</u> the next figure of the dividend

        Remember the six steps thus:
          1. Divide
          2. Multiply
          3. Compare
          4. Subtract
          5. Compare
          6. Bring down

e. Difficulties and when presented (1)
    (1) Divide by 11 and check
    (2) Divide by 12 and check
    (3) Divide by 21 and check
    (4) Eventually use any divisor ending in 1, 2, 3, 4
        or 5 the first figure always correct
    (5) Division of dollars and cents
    (6) Remainders in long division
    (7) Zero difficulties
        Difficulty I. When you cannot divide place a
        zero in the quotient and bring down the next
        number
    (8) All divisors ending in 1, 2, 3, 4 or 5 when
        quotient figure is not always correct
        Difficulty II. When you cannot subtract lower
        the quotient figure
    (9) Divisors ending in 6, 7, 8, or 9 quotient figure
        always correct
    (10) Divisors ending in 6, 7, 8, or 9 quotient figure
        not always correct
        Difficulty III. When your remainder is the
        same or larger than your divisor raise your
        quotient figure
    (11) Trying 9 as a quotient figure
    (12) Finding quotient figures at a glance
    (13) Divisors from 13 to 18

f. Checking: There is no trial divisor for divisors between
        13 - 18. Teach children to guess or estimate
        mentally
    (1) To check an example in division, multiply the
        quotient by the divisor and add the remainder to
        the product. The result should equal the dividend.
        Teach checking from the beginning. (2)

(1) Strayer-Upton, <u>Social Utility Arithmetic</u>, Book 3, American Book Co.,
New York City, (1) pp. 47-58   (2) pp. 37-86

C. Fractions
    1. Introduction of fractions
        a. Vocabulary

numerator	denominator
proper fractions	improper fractions
mixed numbers	fraction
terms	form
reduce	reduction
related	like denominators
common denominators	unlike denominators
whole numbers	value

        b. Review fractional concepts of previous grades.
        c. New fractional concepts
            (1) Parts of a whole - a fraction is a broken number.
                Teach by illustration:
                (a) parts of pie
                (b) parts of money   1/4 of dollar
                (c) parts of fruit   1/2 of orange
                (d) parts of paper   1/3 of paper
            (2) A fraction has two terms, denominator and
                numerator
                (a) The denominator is the number below the line.
                      It tells us into how many equal parts the
                      whole is divided
                (b) The numerator is the number above the line.
                      It tells us how many parts of the whole we
                      are using

    2. Kinds of Numbers
        a. Whole numbers
        b. Proper fractions
            (1) A fraction less than 1. Its numerator is smaller
                than the denominator. $\frac{3}{4}$
        c. Improper fractions
            (1) A fraction equal to or larger than 1. Its
                numerator is the same or larger than the
                denominator. $\frac{8}{8}$ or $\frac{9}{8}$
        d. Mixed numbers
            (1) Has a whole number and a fraction like $2\frac{1}{3}$

    3. Reductions
        a. Proper fractions
            (1) Reduce or change to lower terms or simplest form
$$\frac{4}{8} \genfrac{}{}{0pt}{}{(\div 4)}{(\div 4)} \quad \frac{1}{2}$$

           (2) Change to higher terms
$$\frac{1}{2} \genfrac{}{}{0pt}{}{(\times 4)}{(\times 4)} \quad \frac{4}{8}$$

                Establish concept - multiplying and dividing
                both terms of a fraction does not change its value

b. Improper fractions
   (1) Change to lowest terms

$$\frac{4}{4} = 1 \qquad \frac{5}{4} = 1\frac{1}{4} \qquad \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$

4. Addition
   a. Like fractions
      (1) Sum less than one, no reduction

$$
\begin{array}{ll}
1/3 & 1/5 \\
\underline{1/3} & \underline{3/5} \\
2/3 & 4/5
\end{array}
$$
      1. Add fr.

      (2) Sum equal to one

$$
\begin{array}{ll}
1/2 & 1/8 \\
\underline{1/2} & \underline{7/8} \\
2/2 = 1 & 8/8 = 1
\end{array}
$$
      1. Add fr.
      2. Reduce

      (3) Sum less than one; reduction

$$
\begin{array}{ll}
1/4 & 5/8 \\
\underline{1/4} & \underline{1/8} \\
2/4 = 1/2 & 6/8 = 3/4
\end{array}
$$
      1. Add fr.
      2. Reduce

      (4) Sum more than one

$$
\begin{array}{ll}
3/4 & 7/8 \\
\underline{2/4} & \underline{3/8} \\
5/4 = 1\frac{1}{4} & 10/8 = 1\frac{2}{8} = 1\frac{1}{4}
\end{array}
$$
      Same

      (5) Whole numbers and fractions

$$
\begin{array}{ll}
1 & 2 \\
\frac{1}{2} & \frac{2}{4} \\
\underline{} & \underline{2} \\
1\frac{1}{2} & 3\frac{2}{4}
\end{array}
$$
      Same

      (6) Mixed number and fraction, like fractions

$$
\begin{array}{ll}
1\,1/8 & 1/6 \\
\underline{3/8} & \underline{6\,1/6} \\
1\,4/8 = 1\,1/2 & 6\,2/6 = 6\,1/3
\end{array}
$$
      1. Add fractions
      2. Add whole numbers
      3. Reduce

      (7) Two mixed numbers

$$
\begin{array}{lll}
3\,1/4 & 3\,1/4 & 6\,4/5 \\
\underline{2\,1/4} & \underline{3\,3/4} & \underline{7\,2/5} \\
5\,2/4 = 5\,1/2 & 6\,4/4 = 7 & 13\,6/5 = 14\,1/5
\end{array}
$$
      Same

5. Subtraction
   a. Like fractions
      (1) Minuend larger than the subtrahend
         (a) Fraction minus a fraction

$$
\begin{array}{ll}
3/4 & 7/8 \\
\underline{1/4} & \underline{5/8} \\
2/4 = 1/2 & 2/8 = 1/4
\end{array}
$$
         1. Subtract fractions
         2. Reduce

         (b) Mixed number minus a fraction

$$
\begin{array}{ll}
3\,3/4 & 5\,5/7 \\
\underline{1/4} & \underline{3/7} \\
3\,2/4 = 3\,1/2 & 5\,2/7
\end{array}
$$
         1. Subtract fractions
         2. Subtract whole numbers
         3. Reduce

         (c) Mixed number minus a whole number

$$
\begin{array}{ll}
4\,2/3 & 5\,5/8 \\
\underline{1\,1/3} & \underline{4\,3/8} \\
3\,1/3 & 1\,2/8 = 1\frac{1}{4}
\end{array}
$$
         Same

(d) Mixed number minus a whole number

$$8 \frac{1}{2}$$
$$\underline{6}$$
$$2 \frac{1}{2}$$

$$7 \frac{3}{4}$$
$$\underline{6}$$
$$1 \frac{3}{4}$$

Same

(2) Subtraction involving changing the form

(a) A whole number minus a fraction

$$6 \quad = 5 \frac{2}{2}$$
$$\underline{\frac{1}{2} \quad \frac{1}{2}}$$
$$5 \frac{1}{2}$$

$$8 \quad = 7 \frac{4}{4}$$
$$\underline{\frac{3}{4} \quad \frac{3}{4}}$$
$$7 \frac{1}{4}$$

1. Subtract fractions
   (a) change form
2. Subtract whole numbers
3. Reduce

(b) A whole number minus a mixed number

$$5 \quad = 4 \frac{4}{4}$$
$$\underline{4 \frac{1}{4} \quad 4 \frac{1}{4}}$$
$$\frac{3}{4}$$

$$9 \quad = 8 \frac{2}{2}$$
$$\underline{5 \frac{1}{2} \quad 5 \frac{1}{2}}$$
$$3 \frac{1}{2}$$

Same

(c) Mixed number minus a fraction

$$8 \frac{1}{3} = 7 \frac{4}{3}$$
$$\underline{\frac{2}{3} \quad \frac{2}{3}}$$
$$7 \frac{2}{3}$$

$$9 \frac{3}{5} = 8 \frac{8}{5}$$
$$\underline{\frac{4}{5} \quad \frac{4}{5}}$$
$$8 \frac{4}{5}$$

Same

(d) Mixed number minus a mixed number

$$7 \frac{3}{5} = 6 \frac{8}{5}$$
$$\underline{5 \frac{4}{5} = 5 \frac{4}{5}}$$
$$1 \frac{4}{5}$$

$$8 \frac{1}{4} = 7 \frac{5}{4}$$
$$\underline{4 \frac{3}{4} = 4 \frac{3}{4}}$$
$$3 \frac{2}{4} = 3 \frac{1}{2}$$

Same

6. Addition

a. Unlike fractions

(1) Rules for finding Least Common Denominator
  (a) Inspection – Look at the largest denominator to see if all others go into it evenly
  (b) Multiply the largest denominator by 2,3,4,etc.

(2) Sums less than one

$$\frac{1}{2} = \frac{2}{4}$$
$$\underline{\frac{1}{4} \quad \frac{1}{4}}$$
$$\frac{3}{4}$$

$$\frac{3}{8} \quad \frac{3}{8}$$
$$\underline{\frac{1}{2} = \frac{4}{8}}$$
$$\frac{7}{8}$$

1. Find L. C. D.
2. Raise to higher terms
3. Add fractions
4. Reduce

(3) Sums more than one

$$\frac{1}{2} = \frac{2}{4}$$
$$\underline{\frac{3}{4} \quad \frac{3}{4}}$$
$$\frac{5}{4} = 1 \frac{1}{4}$$

$$\frac{5}{6} \quad \frac{5}{6}$$
$$\underline{\frac{1}{3} = \frac{2}{6}}$$
$$\frac{7}{6} = 1 \frac{1}{6}$$

Same

(4) Harder mixed numbers

$$16 \frac{3}{5} = 16 \frac{9}{15}$$
$$\underline{4 \frac{1}{3} = 4 \frac{5}{15}}$$
$$20 \frac{14}{15}$$

$$1 \frac{1}{3} = 1 \frac{4}{12}$$
$$\frac{3}{4} = \frac{9}{12}$$
$$\underline{8 \frac{1}{2} = 8 \frac{6}{12}}$$
$$9 \frac{19}{12} = 10 \frac{7}{12}$$

1. Bring over whole number
2. Find L. C. D.
3. Raise to higher terms
4. Add fractions
5. Add whole numbers
6. Reduce

7. Subtraction
   a. Unlike Fractions
      (1) Steps follow addition of unlike fractions
          (a) Unlike Fractions involving the harder step in
              changing form.

$$7 \ 1/2 = 7 \ 2/4 = 6 \ 6/4$$
$$2 \ 3/4 = 2 \ 3/4 = \underline{2 \ 3/4}$$
$$4 \ 3/4$$

1. Bring over the whole number
2. Find L. C. D.
3. Raise to higher terms
4. Subtract fractions
   (a) Change the form
5. Subtract whole numbers
6. Reduce

          (b) Systematic review of addition and subtraction of
              fractions using the same problem for both
              steps e.g.:

$$\begin{array}{c} 6 \\ \underline{+ \ 3/4} \\ 6 \ 3/4 \end{array} \qquad 6 = 5 \ 4/4$$
$$- \ 3/4 = \underline{3/4}$$
$$5 \ 1/4$$

$$7 \ 1/2 = 7 \ 3/6 \qquad\qquad 7 \ 1/2 = 7 \ 3/6 = 6 \ 9/6$$
$$+4 \ 2/3 = \underline{4 \ 4/6} \qquad -4 \ 2/3 = 4 \ 4/6 = \underline{4 \ 4/6}$$
$$11 \ 7/6 = 12 \ 1/6 \qquad\qquad\qquad\qquad 2 \ 5/6$$

D. Decimals
   1. United States Money
      a. Using all four processes

$$\begin{array}{c} \$4.48 \\ \underline{+3.75} \end{array} \qquad \begin{array}{c} \$10.00 \\ \underline{- \ 8.23} \end{array} \qquad \begin{array}{c} \$2.95 \\ \underline{\times \ 48} \end{array}$$

         1/5 of $160   22)$124.74

E. Denominate Numbers
   1. Review work done in previous grades
   2. Fractional parts
      a. 6 in. = _____ ft.
          4 lemons = _____ doz.
          18 oranges = _____ doz.

      All common denominate numbers that the child finds a use
      for should be taught in the above form

F. Problem Solving
   1. One step
      a. As presented in Grade Four, Sec. F.
   2. Two question problems
      a. Both questions stated
   3. Finding averages
      a. Class averages
   4. Making change

G. Bar graphs

Grade 6

I. Minimum Requirements
    A. Reading and writing numbers
        1. Review work taught in previous grade.
        2. Arabic numbers taught through 8 and 9 digits.

    B. Fundamental Processes
        1. Review addition, subtraction and multiplication.
        2. Division by three figure divisors.

    C. Fractions
        1. Review addition and subtraction
        2. Multiplication
            a. vocabulary
            b. suggested procedures
            c. types of examples

        3. Division
            a. vocabulary
            b. suggested procedures
            c. types of examples

    D. Decimals
        1. Vocabulary.
        2. Reading and writing decimals.
        3. Value of decimals.
        4. Changing decimal fractions to common fractions
        5. Addition and subtraction
            a. suggested procedures
        6. Multiplication
            a. suggested procedures
        7. Division
            a. suggested procedures

    E. Perimeter

    F. Area

    G. Two Step Problems

    H. Circle Graphs

    I. Avoid crutches

	Reading & Writing Nos.	Fundamental Processes	Fractions	Denominate Numbers	Decimals	Problem Solving
		Review 4 fundamental processes				
September	Review	Review long div. All difficulties NEW – 3 figure devisor	Review Addition and Subtraction	Review	Fundamental Processes using U. S. Money	Practice
October	NEW Teach thru 8 digits	Practice continued	NEW-Multiplication of fractions. Practice + –	Use Measures learned in meaningful situations	Same	Same
November	Use Roman Numerals	Continue Practice	NEW-Division of fractions Practice + –	Same	Same	Problems using fractions
Dec.	Review	Continue practice	Drill all 4 fundamental processes	NEW Perimeter	Same	Same
Jan.	We suggest that the months of January and June be devoted to some activity in which the work of the semester is put into actual use.					
February	Teach thru 9 digits	Review the + – x + facts preparatory to work in decimals	Review	Review all measures learned to date	NEW-Reading & writing of decimals thru 3 places	
March	Review	Drill on above	Review	Same Review perimeter	Practice reading & writing NEW-Teach value of dec. changing dec. to common fractions. Addition of dec.	
April	Review	Drill on above	Review	NEW Teach Area	NEW-Teach ₤ + of decimal fractions	
May	Review	Same	Review	Review	New-Teach division of decimal fractions	
June	We suggest the months of June and January to be devoted to some activity in which the work of the semester is put into actual use.					

Problem Solving should be a continuous activity. It is not an isolated item to be taught and dropped.

II. Minimum Requirements in Detail.

    A. Reading and Writing Numbers
        1. Review
        2. Arabic Numbers taught through 8 and 9 digits according to method, outlined in Grade IV, pp. 27-28.

    B. Fundamental Processes
        1. Review addition, subtraction, multiplication
        2. Division by three figure divisors
            a. Review finding trial divisors using three figure divisors

    C. Fractions
        1. Review addition and subtraction
        2. Multiplication
            a. Vocabulary
                cancel, cancelling, cancellation, multiplier, multiplicand, product, times
            b. Suggested procedures
                (1) Stress the fact that "of" means "times"
                (2) A whole number may be expressed with a denominator of one
                (3) Practice short division to facilitate teaching cancellation
                (4) Cancellation should be taught as a short cut method _after_ the usual procedure of multiplying a fraction or a mixed number by an integer has been learned
                (5) Stress the fact that all answers must be expressed in simplest form
                (6) Stress the importance of paying attention to signs before beginning work
            c. Types of examples
                (1) Proper fractions multiplied by integers

$$12 \times \tfrac{1}{7} \qquad \tfrac{1}{7} \times 12 \qquad \tfrac{1}{2} \text{ of } 8$$

                (2) Mixed numbers multiplied by integers

$$10 \times 2\tfrac{1}{2} = \qquad 10$$

$$\frac{10}{1} \times \frac{5}{2} \qquad \frac{2\tfrac{1}{2}}{5} \qquad \tfrac{1}{2} \times \frac{\cancel{10}}{1} = 5$$

$$\frac{20}{25}$$

                (3) Proper fractions multiplied by a proper fraction

$$\frac{2}{5} \times \frac{4}{5} \qquad\qquad \frac{1}{3} \times \frac{9}{10}$$

      (4) Mixed numbers multiplied by proper fractions

$$2\frac{1}{2} \times \frac{3}{4} \qquad\qquad \frac{7}{8} \times 2\frac{2}{3}$$

      (5) Mixed numbers multiplied by mixed numbers

$$3\frac{1}{3} \times 1\frac{1}{2} \qquad\qquad 4\frac{4}{5} \times 7\frac{7}{8}$$

3. Division
    a. Vocabulary
        divide, divisor, invert, quotient, dividend,
        reciprocal
    b. Suggested procedures
        (1) Divisor must be inverted and the inverted
             divisor is called the reciprocal

        (2) A whole number may have a denominator
             1 as 4 $\frac{4}{1}$

        (3) The sign ÷ means "divided by".
        (4) The dividend (the number to be manipulated)
             is always to the left of the sign
    c. Types of examples
        (1) Proper fractions divided by integers

$$\frac{7}{8} \div 2 \text{ and } 2 \div \frac{7}{8}$$

             Proper fractions divided by a proper
             fraction

$$\frac{8}{9} \div \frac{1}{2} \qquad\qquad \frac{3}{4} \div \frac{1}{3}$$

        (3) Mixed Numbers divided by integers

$$2\frac{2}{3} \div 6 \text{ and } 6 \div 2\frac{2}{3}$$

        (4) Mixed Numbers divided by proper fractions

$$3\frac{3}{4} \div \frac{7}{8} \text{ and } \frac{7}{8} \div 3\frac{3}{4}$$

        (5) Mixed Numbers divided by mixed numbers

$$3\frac{3}{5} \div 2\frac{1}{2} \qquad\qquad 1\frac{1}{3} \div 2\frac{7}{8}$$

D. Decimals:
  1. Vocabulary   tenths
      decimal fraction   hundredths
      decimal point   thousandths
      mixed decimal   ten-thousandths
  2. Reading and writing of decimals through four places
      a. When writing decimals from dictation a pupil
         should learn to think.
            (1) number of decimal <u>places</u> in the number
                stated
            (2) number of <u>digits</u> in the number stated
            (3) number of <u>zeros</u> needed to fill the
                required places
      b. Teach the function of zeros in decimal fractions
  3. Value of decimals
      a. Teach arranging decimal fractions according to
         their ascending and descending value.

          .083   2.6
          .09   .9
          .147   .87
          .6   .3
         1.5   .125

  4. Changing decimal fractions to common fractions.

$$.3 = \frac{3}{10} \qquad\qquad .5 = \frac{5}{10} = \frac{1}{2}$$

$$6.75 = 6\frac{75}{100} = 6\frac{3}{4}$$

(teacher information only) $.06\frac{1}{4} = \frac{6\frac{1}{4}}{100} = \frac{25}{4} \div 100 = \frac{\overset{1}{\cancel{25}}}{4} \times \frac{1}{\underset{4}{\cancel{100}}} = \frac{1}{16}$

  5. Addition and subtraction
      a. Suggested procedures
         (1) Introduce with use of U. S. Money
            Show the analogy to common fractions

$$\frac{1}{10} = .1 \qquad\qquad \frac{9}{10} = .9$$

$$+\,\frac{3}{10} = .3 \qquad\qquad -\,\frac{7}{10} = .7$$

$$\frac{4}{10} = .4 \qquad\qquad \frac{2}{10} = .2$$

6. Multiplication
    a. Suggested procedures
            (1) Introduce with use of U. S. Money
            (2) Show the analogy to common fractions

$$\begin{array}{c}.7\\ \underline{\times 5}\\ 3.5\end{array} = \frac{7}{10} \times 5 = \frac{35}{10} = 3\frac{5}{10}$$

$$\begin{array}{c}.7\\ \underline{\times .3}\\ .21\end{array} = \frac{7}{10} \times \frac{3}{10} = \frac{21}{100}$$

7. Division
    a. Suggested procedures
            (1) Introduce with use of U. S. Money
            (2) Divide a decimal by a whole number
            (3) Divide a decimal by a whole number
                 with remainders
            (4) Divide a whole number by a whole number
            (5) Change a common fraction to a decimal
            (6) Teach 20 decimal equivalents

$\frac{1}{2} =$ $\frac{3}{5} =$ $\frac{7}{8} =$ $\frac{1}{10} =$

$\frac{1}{4} =$ $\frac{4}{5} =$ $\frac{1}{3} =$ $\frac{3}{10} =$

$\frac{3}{4} =$ $\frac{1}{8} =$ $\frac{2}{3} =$ $\frac{7}{10} =$

$\frac{1}{5} =$ $\frac{3}{8} =$ $\frac{1}{6} =$ $\frac{9}{10} =$

$\frac{2}{5} =$ $\frac{5}{8} =$ $\frac{5}{6} =$ $\frac{1}{20} =$

            (7) Divide a decimal by a decimal
            (8) Divide a whole number by a decimal

E. Perimeter
    1. Find perimeter of objects within the child's
        experience.
    2. Teach the perimeter as a straight line extending
        about all sides.
    3. Figures to be recognized (no definitions to be
        learned)
            a. rectangle - square - oblong
            b. triangle

F. Area (1)

    1. Build by actual experience a concrete concept of
       square in., square ft., square yd.

    2. Make finding areas a meaningful experience

G. Problem Solving

    1. Introduce two step problems. Follow the advice
       given in Gr. 4 Sec. F, p. 41.

H. Graphs

    1. Use circle graphs to portray such activities as
       lend themselves to that kind of treatment.

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(1) Morton, R. L., _Teaching Arithmetic in the Elementary School_,
Primary Grades, Silver Burdett Co.

100 Addition facts

0	5	2	3	1	3	1	6	7	1	8	2	0
0	5	2	3	2	1	1	1	1	6	1	9	4

0	1	1	8	4	9	4	7	2	0	5	8	6
2	4	3	2	5	9	4	7	3	5	1	8	6

1	8	9	0	9	4	4	1	5	2	1	2	1
7	0	2	6	1	1	2	9	2	7	8	8	0

3	5	2	2	2	5	9	2	0	4	3	3	0
4	4	4	0	1	0	3	6	1	6	8	0	3

4	0	9	6	0	7	1	3	0	6	4	8	3
0	8	0	3	7	0	5	2	9	0	3	3	9

5	2	3	7	4	8	3	5	3	4	7	6	6
3	5	5	2	7	4	7	6	6	8	3	2	5

7	6	9	6	5	4	5	7	8	7	9	6	9
4	7	4	4	9	9	7	5	9	6	5	9	8

8	8	9	6	5	8	7	7	9
7	5	6	8	8	6	8	9	7

100 Subtraction Facts

0 0	5 1	3 2	7 7	1 1	8 1	3 3	4 4	5 3	6 6	4 2	9 1	9 9
3 0	5 4	6 0	5 2	9 0	6 1	3 1	2 1	7 1	6 5	9 8	4 1	8 4
4 0	5 5	5 0	6 3	4 3	2 2	10 1	10 2	6 2	2 0	7 0	6 4	7 2
8 8	10 5	9 5	11 2	12 6	8 0	1 0	8 7	7 3	7 5	9 3	7 6	8 2
10 7	9 7	8 6	12 8	10 6	10 4	9 4	9 6	8 3	10 9	10 3	11 7	14 7
9 2	7 4	12 9	11 5	10 8	11 3	12 7	11 6	13 6	8 5	12 3	11 9	12 4
16 8	11 8	12 5	13 9	11 4	14 8	15 8	14 6	15 6	13 7	13 5	13 8	13 9
16 7	15 7	15 9	13 4	17 9	14 5	17 8	16 9	14 9				

Borrowing Difficulties

Borrow from 10's

75	80	92	63
-27	-65	-86	- 9
48	15	6	54

Borrow from 10's

562	380	461	783
-327	-253	-158	-756
235	127	303	27

Borrow from 100's

327	508	635	827
-156	-232	-571	-567
171	276	64	260

Borrow twice from 10's and 100's

523	720	325	562	402	800
-275	-563	-289	-553	-235	-624
248	157	36	9	167	176

Money

$.25	$2.04	$2.00	$6.25
- .08	- .28	- .28	- 4.79
$.17	$1.76	$1.72	$1.46

100 Multiplication facts

1	4	5	5	1	6	2	3	1	7	2	1	2
5	1	2	6	2	1	2	1	6	1	3	7	5

0	1	3	3	1	4	7	2	0	1	2	0	4
1	3	2	3	9	5	2	1	2	4	0	5	2

3	3	2	0	5	9	0	5	0	1	4	2	8
4	0	7	8	5	1	0	3	6	8	0	4	1

1	0	1	6	4	6	5	2	3	8	0	6	8
0	4	1	0	4	2	0	8	5	2	7	3	0

5	0	7	2	9	0	2	9	5	4	3	7	3
1	9	0	9	0	3	6	2	4	3	6	5	7

9	7	4	9	7	6	5	9	8	6	8	5	8
9	4	6	5	7	4	7	3	3	6	5	9	4

3	6	4	9	8	5	7	6	3	6	7	4	8
9	5	7	4	8	8	3	8	8	7	6	9	6

4	8	8	9	6	9	7	9	7
8	9	7	8	9	7	8	6	9

90 Division Facts

2)2̄	7)7̄	8)2̄4̄	9)9̄	5)5̄	8)6̄4̄	6)4̄8̄	4)2̄8̄	4)4̄
8)4̄8̄	4)2̄4̄	1)1̄	9)6̄3̄	4)0̄	1)2̄	4)3̄6̄	5)0̄	6)0̄
7)4̄9̄	9)0̄	7)4̄2̄	8)4̄0̄	3)3̄	9)5̄4̄	9)3̄6̄	8)7̄2̄	6)6̄
2)0̄	7)2̄8̄	6)1̄8̄	8)5̄6̄	7)0̄	7)6̄3̄	3)2̄4̄	6)5̄4̄	8)0̄
3)2̄7̄	9)7̄2̄	1)9̄	1)8̄	4)1̄6̄	5)2̄0̄	6)2̄4̄	5)4̄5̄	1)7̄
2)8̄	1)0̄	6)4̄2̄	4)1̄2̄	2)1̄2̄	3)6̄	9)1̄8̄	5)4̄0̄	3)1̄5̄
4)3̄2̄	8)1̄6̄	7)2̄1̄	2)1̄4̄	2)1̄8̄	1)4̄	3)2̄1̄	5)1̄0̄	4)8̄
4)2̄0̄	5)3̄0̄	2)6̄	7)5̄6̄	1)6̄	3)1̄2̄	9)8̄1̄	9)4̄5̄	8)3̄2̄
5)1̄5̄	3)9̄	6)3̄0̄	5)3̄5̄	6)1̄2̄	2)1̄0̄	1)3̄	9)2̄7̄	6)3̄6̄
5)2̄5̄	7)3̄5̄	1)5̄	2)1̄6̄	2)4̄	3)1̄8̄	7)1̄4̄	3)0̄	8)8̄

Grade 4

Kinds of numbers
Arabic
Roman

Addition
sum
addends
plus
total amount

Subtraction
subtract
difference
remainder
minus
minuend
subtrahend
take away
how much is left
more than
higher
less
change received
borrowing

Multiplication
multiplicand
multiplier
partial product
product
carrying
times

Division
dividend
divisor
quotient
shared equally
divided equally
average

Denominate Numbers
bushel
ton
degree of temperature
dozen
gross
square
oblong
cirloe
triangle

Grade 5

Fractions
numerator
denominator
proper fraction
improper fraction
mixed number
fraction
terms
form
reduce
reduction
related
like denominators
unlike denominators
common denominators
whole number
value

Grade 6

Fractions
cancel
cancelling
cancellation
"of" means times
invert
reciprocal

Decimals
decimal fraction
decimal point
mixed decimal
tenths
hundredths
thousandths
ten-thousandths
digits

Measurements
perimeter
area
rectangle
square inch
square foot
square yard